YF33 RINGER

YOKE & FLYBACK TESTER AND SWEEP CIRCUIT ANALYZER

OPERATION, APPLICATION, & SERVICE MANUAL

SENCORE

THE ALL AMERICAN LINE OF HIGH QUALITY TEST EQUIPMENT

SAFETY REMINDERS

When testing electronic equipment, there is always a danger present. Unexpected high voltages can be present at unusual locations in defective equipment. The technician should become familiar with the device that he is working on and observe the following precautions.

1. When making test lead connections to high voltage points, remove the power. If this cannot be done, be sure to avoid contact with other equipment or metal objects. Place one hand in your pocket as a safety precaution and stand on an insulated floor to reduce the possibility of shock.

2. Discharge filter capacitors before connecting test leads to them. Capacitors can store a charge that could be dangerous to the technician.

3. Be sure your equipment is in good order. Broken or frayed test leads can be extremely dangerous and can expose the technician to dangerous potentials.

4. Remove the test leads immediately after the test has been completed to reduce the possibility of shock.

5. Do not work alone when working on hazardous circuits. Always have another person close by in case of accident. Remember, even a minor shock can be the cause of a more serious accident, such as falling against the equipment, or coming in contact with high voltages.

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INTRODUCTION AND GENERAL OPERATION

Today's television service technician frequently encounters the perplexing problem of locating component failures in the yoke and high voltage flyback sections of television receivers. These components typically have not been easy to troubleshoot or test. The technician often had to resort to time-consuming substitution to identify a faulty yoke or flyback transformer.

In addition to the many tube-type sweep and high voltage sections employed over the years, modern receivers are now using a variety of solid state components, such as transistors, SCR's and Triacs. Because of this increasing complexity, technicians have asked for a simplified tester that would check all these yokes and flybacks quickly and accurately.

THE RINGING TEST

The patent pending Ringing Test allows for testing of any yoke, flyback, larger coils, or vertical output transformers in minutes. Simply connect the two leads across the windings of the device under test. Depress the "Ringing Test" button, then depress each of the six impedance matching buttons, one at a time. If a "GOOD" readout is obtained for one or more of the buttons, the device is good. If none of the buttons offer a "GOOD" readout, the component under test may not necessarily be at fault.

There are a number of conditions that will cause a good component to test BAD. These are detailed under the various test sections further in the manual.

This describes the overall operation of the Ringing Test and is the procedure to follow whenever the instructions indicate "perform the Ringing Test."

MEASURING PEAK–TO–PEAK DRIVE SIGNALS AND HIGH VOLTAGE

The YF33 "Ringer" is a complete sweep circuit and horizontal output analyzer, too.

The horizontal output circuit of any TV contains the yoke, flyback and other interrelated circuitry. The Ringing Test allows you to determine whether the problem is in the yoke or flyback. However, the operation of the entire horizontal section is also dependent on the drive signals as well as the focus and high voltage. To make the Ringer a complete sweep circuit analyzer we have included ranges for the measuring of drive signals and high voltages. By measuring the

drive signals, a technician can determine whether or not the problem is located back in the chassis, by allowing him to compare the drive signal measured using the YF33 with the schematic values. These measurements can be made using the leads supplied with the Ringer.

Finally, by using the YF33 to check second anode and focus voltages, the technician can isolate additional problems in the high voltage, focus, and boost voltage sections. He can also verify that the receiver is operating normally and within specifications. These measurements require the Focus Voltage and High Voltage Probe accessories, FP201 and 39G89, available at your local Sencore FLPD Distributor.

CAUTION: WHEN MEASURING THESE VOLTAGES, MAKE CONNECTIONS TO THE RECEIVER ONLY WITH THE SET POWER OFF. TURN THE POWER ON ONLY TO MAKE THE TEST, AND TURN IT OFF BEFORE REMOVING THE TEST LEADS.

SPECIFICATIONS

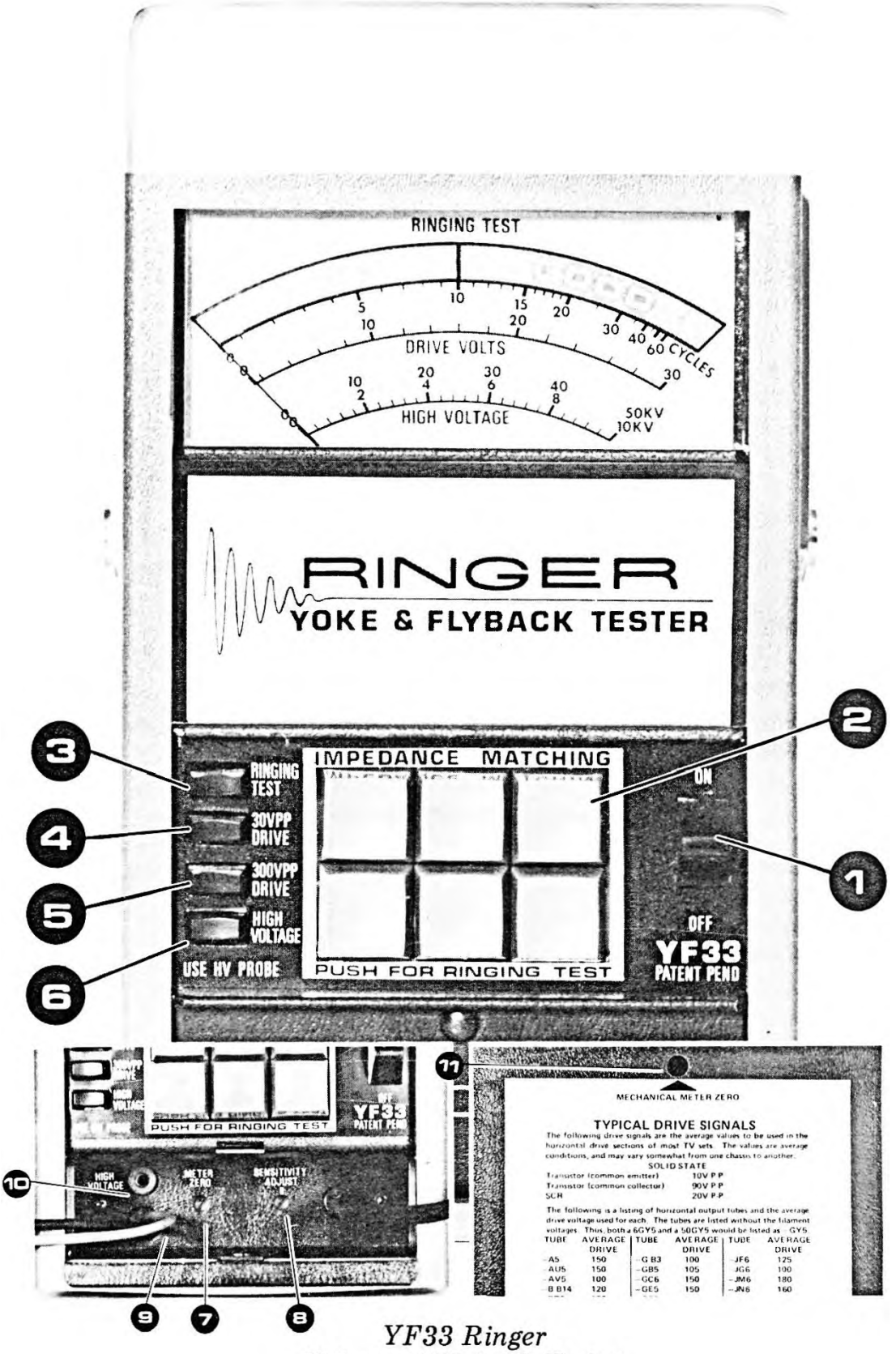
DEVICES TESTED:	Horizontal and Vertical yokes, flyback transformers, Vertical Output transformers, Horizontal Linearity coils, Horizontal Efficiency coils and numerous general application mid-frequency coils.
RINGING TESTS:	Test: Dynamic Ringing Test counting number of cycles coil rings before reaching a preset damping point after a given exciting pulse has been applied. Exciting Pulse Amplitude: 0 to + 15V P—P Exciting Pulse Repetition Rate: 100 — 120 pulses/sec. Synced to AC line frequency. "GOOD-BAD": Meter calibrated to give "GOOD" reading for 10 or more cycles. Accuracy: ± 1 cycle at midscale.
SENSITIVITY CONTROL:	Variable: Selects signal level at which counting circuit stops counting cycles. Range: Typically 50% to 10% of exciting pulse amplitude. Calibration: Normal cutoff = 25% of exciting pulse amplitude at mid-rotation of the control.
P—P DRIVE SCALE:	Range: 0 — 30VAC P—P 0 — 300VAC P—P

HIGH VOLTAGE SCALE:	Range: 0 — 10KV DC (with optional FP201 probe). 0 — 50KV DC (with optional 39G89 probe used with FP201 probe). Accuracy: ± 3% full scale.
POWER REQUIREMENTS:	105 — 130VAC, 50—60Hz, 10 watts.
MECHANICAL:	Meter: 4½", moving coil movement, 100uA, 1900 ohm (illuminated). Accuracy: ±2% Meter Light: 1 - No. 47 pilot lamp in meter serves as "ON" indicator Case: Molded acrylic and vinyl covered steel. Brushed aluminum handle also serves as tilt bail for bench use. Size: 10" (25.4cm) x 5½" (13.8cm) x 3½" (8.9cm). Weight: 4¾ lbs. (2.2Kg.)
ACCESSORIES:	Hook-up Leads: Two leads with alligator clips (attached to YF33.) FP201: 10Kv Focus Voltage Probe (optional accessory). 39G89: 50Kv High Voltage Probe (optional accessory) slips on FP201 for extended range.

DESCRIPTION

The YF33 Ringer connects across any winding of a flyback transformer or either section of a yoke. When each of the six IMPEDANCE MATCHING buttons is pushed, positive exciting pulses are applied to the coil. Each pulse will cause the coil to ring, producing a damped sine wave signal. This signal is fed back into the YF33. At normal sensitivity the YF33 counts the number of ring cycles until the signal decays to 25% of the exciting pulse amplitude. Ten or more ring cycles detected before cutoff provides a "GOOD" meter indication. The SENSITIVITY control adjusts the level at which the circuit stops counting ring cycles. A good coil will always give 10 or more ring cycles.

In order to ring the wide range of coil impedances used in television yokes and flyback coils, six ranges of capacitance are used. To match these impedances, each of the six buttons is pushed in turn. The button giving the highest reading provides the proper impedance match for the coil being tested. THE COIL IS CONSIDERED GOOD IF ONE OR MORE OF THE BUTTONS PRODUCES A "GOOD" READING.



YF33 Ringer
Yoke and Flyback Tester

For the ACV P—P Signal Tests, the YF33 incorporates a true Peak-to-Peak AC Voltmeter. The Drive Signal inputs to the horizontal and Vertical output sections can be measured directly with this function.

Focus and High Voltages are measured directly by the meter circuit, using accessory High Voltage Probes.

The YF33 has built-in protection against accidental application of drive or high DC voltages on the wrong range or function. Both the pulse detector input FET and the meter bridge circuit FET are protected by diodes on the FET gates.

CONTROLS

The following controls are located on the YF33 Front Panel:

1. ON—OFF: Applies power to the instrument.

2. IMPEDANCE MATCHING PUSHBUTTONS: Six pushbuttons select matching impedance to resonate coil winding for Ringing Test.

3. RINGING TEST: Applies ringing signal to coil under test when IMPEDANCE MATCHING buttons are pressed, and measures quality on "GOOD—BAD" meter scale.

4. 30V P—P DRIVE: Measures ACV P—P (solid state or SCR).

5. 300V P—P DRIVE: Measures ACV P—P (common collector or tube-type).

6. HIGH VOLTAGE: Measures to 10Kv DC when used with FP201 Focus Probe for focus or boost voltages. Also measures to 50Kv DC when used with 39G89 High Voltage Probe in conjunction with FP201.

7. METER ZERO: Adjusts electrical zero calibration of meter reading.

8. SENSITIVITY ADJUST: Adjusts ringing detector circuit sensitivity.

9. TEST LEADS: Used for all tests except HV.

10. HV JACK: Used for connection of optional High Voltage Probes.

11. MECHANICAL METER ZERO: (Accessible through the rear panel). Adjusts meter zero setting with power off.

Following are the operating instructions for the YF33. These instructions refer to Service Tips at the back of this book. We suggest to first read completely through the manual, then read the Service Tips. Once the technician becomes familiar with the operation of the Ringer, it should only be necessary to refer to the Service Tips without referring to the instructions.

OPERATION AND APPLICATIONS

Initial Set-Up

1. Slide the meter cover down to expose the meter. Pull down on the lower cover to expose the Lead Storage Compartment.

2. Plug the power cord into any 105 — 130VAC, 50—60Hz outlet.

3. With power off, zero the meter with the Mechanical Adjust control accessible through the back of the case. The setting can be made with a small screwdriver. Normally this adjustment needs only to be done once and checked at regular intervals to be sure the adjustment has not changed.

4. Slide the ON—OFF switch to the "ON" position.

5. Using a small screw driver, turn the electrical zero adjustment, located in the lead storage compartment clockwise until the needle reads slightly to the right of zero. Then slowly set this adjustment until the meter reads exactly zero. Always approach zero from the right side, since very small changes to the left of zero are difficult to detect.
NOTE: Electrical meter zero has no effect in HIGH VOLTAGE position. This adjustment can be made on any of the other three buttons.

IN-CIRCUIT HORIZONTAL OUTPUT SECTION TEST

In-Circuit testing with the YF33 Ringer will check the entire horizontal output section, including the horizontal yoke windings and the horizontal output transformer windings, without disconnecting individual components. A "GOOD" reading with this test will indicate that the output circuit has no shorts in any of the circuits relating to the yoke or flyback.

If a "BAD" reading is obtained, the problem may be located in the windings themselves, or in the circuitry associated with them. It is then necessary to disconnect these circuits individually to isolate the problem to the circuit or component at fault.

Normally, the in-circuit test is done first as a general indication of the condition of the output section. For field work, this test will help determine if the chassis must be returned to the shop for more extensive troubleshooting and repairs. To make the test, proceed as follows:

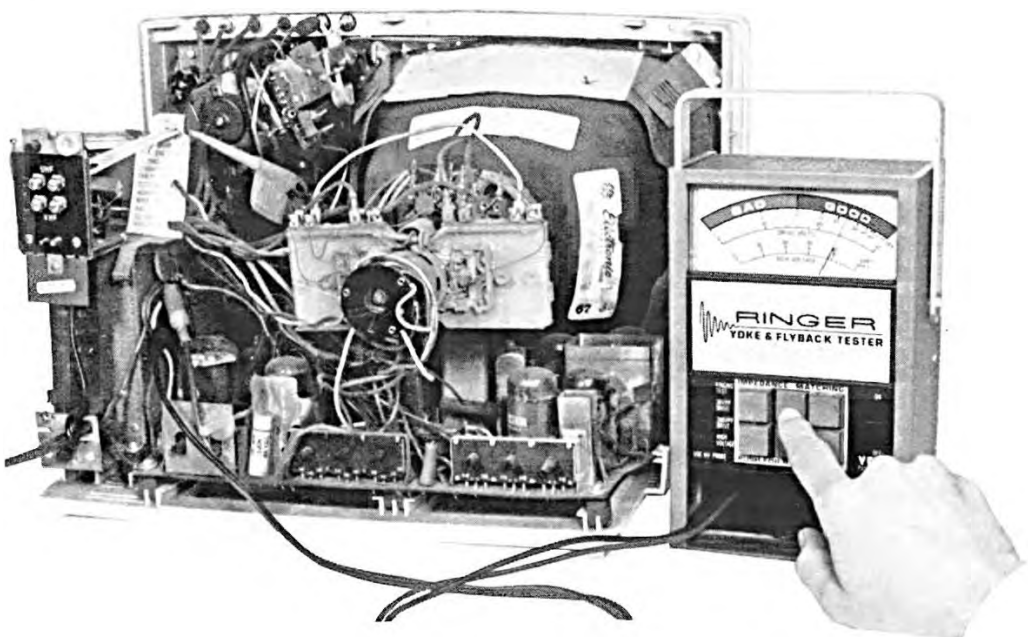
CAUTION: **Be sure that all power to the set is turned off before making connections for the Ringing Test.**

1. Remove the plate cap from the horizontal output tube. Connect the Red lead from the YF33 to the plate cap. Connect the Black lead to the chassis or ground. In solid state sets, remove the collector lead from the horizontal output transistor, as well as the damper diode.

2. Press RINGING TEST button.

3. Push the six IMPEDANCE MATCHING buttons, one at a time. If the meter reads "GOOD", the problem is not located in the yoke or flyback windings. **More than one button may give a "GOOD" reading.**

NOTE: If the meter reads "BAD", the circuits connected to the yoke and flyback should be disconnected and the test repeated after each component is disconnected. This type of testing will locate the cause of the "BAD" test if it is caused by some circuit other than the coil. See the sections below for testing coils out-of-circuit. It will also help isolate a defective external component without the need of completely removing the suspected bad coil. See Service Tip 12 for more details.



In Circuit Test of Horizontal Output Section

NOTE: See Service Tip 1 for information on viewing the Ringing Test with an oscilloscope.

See Service Tip 2 relating to high voltage rectifier tube removal and Service Tip 3 relating to differences of in or out of circuit tests.

OUT OF CIRCUIT YOKE TEST

Individual windings of yokes and flybacks may be tested with the YF33. If the in-circuit test was performed first and gave a "BAD" test, the following tests will locate the problem to the defective section by checking each section individually.

1. For Horizontal Yoke Winding Test:

   a. Disconnect the horizontal yoke winding. On a chassis with a yoke assembly plug, remove the plug. On tube chassis with wired-in yokes, disconnect at least two of the three wires for the horizontal winding. On solid state sets, disconnect one of the two wires to the winding.

   b. Connect the YF33 test leads to the yoke at the disconnected wires, or to the yoke wiring terminals leading to the horizontal winding on the yoke itself, if accessible.

   c. Perform the RINGING TEST.

   d. If there is a possibility that only one of the series windings was tested, as in tube-type sets, connect the YF33 test lead to the remaining winding wire and repeat the Ringing Test, as in (b) through (c) above.

NOTE: See Service Tip 4 for information on intermittent yokes.

See Service Tips 5, 6, and 7 for information on locating the connections to the yoke coils.

See Service Tip 8 if a "BAD" test may have been caused by damping resistors in the yoke assembly.

2. For Vertical Yoke Winding Test:

   a. Disconnect the vertical yoke connections. On a chassis with a yoke assembly plug, remove the plug. On a chassis with a wired-in yoke, disconnect at least three of the four wires for the vertical winding.

b. Connect the YF33 test leads to one of the disconnected wire pairs, or to the terminals on the yoke housing, if accessible.

c. Depress the RINGING TEST button.

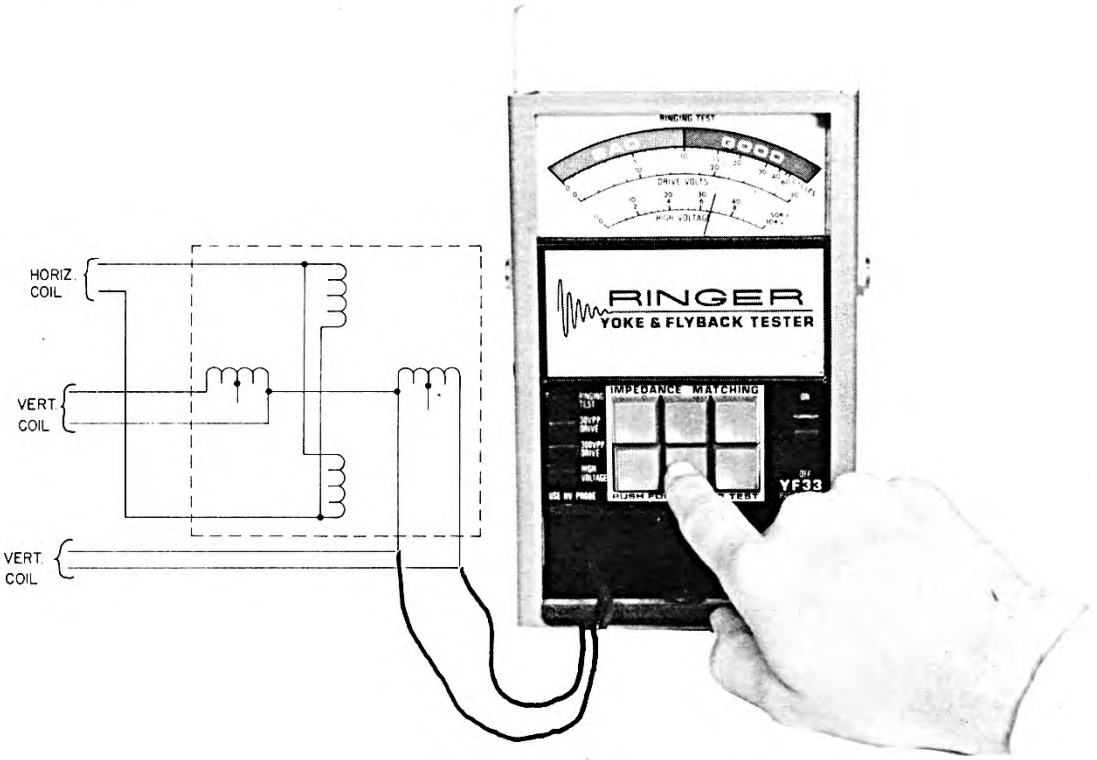
d. Push the six IMPEDANCE MATCHING buttons one at a time. If a "GOOD" reading is indicated on any of the buttons, the coil is good. **The meter may read "GOOD" on more than one button.** Note the button that produces the highest reading and the number of ringing cycles obtained on it.

e. Connect the YF33 test leads to the other vertical coil. Repeat the Ringing Test as in (b) through (d) above. Note again the cycles obtained. Both coils should ring the same number of times, and on the same button. If not, the yoke is bad.

NOTE: Vertical yoke coils generally have separate left and right windings. It is necessary to test each coil individually. The vertical coils are located at the sides of the yoke, as installed on the CRT.

See Service Tips 10, 11, and 15 for information on special conditions that may produce a "BAD" test.

See Service Tip 9 for information on testing the individual sections of the vertical yoke and an explanation of why the two coils should test the same.



Out of Circuit Yoke Check

PRELIMINARY FLYBACK QUICK CHECK

If there is a possibility of a shorted turn in any winding of a flyback transformer, the entire flyback may be tested with this single test:
1. Disconnect the horizontal yoke coils and remove the high voltage rectifier tube. In solid state sets, disconnect the damper diode.

2. Connect the red YF33 test lead to the transformer primary by connecting to the horizontal output plate cap, and the black lead to the chassis or ground.

3. Push each of the six IMPEDANCE MATCHING buttons. **The highest reading indicates flyback circuit quality.**

4. If a "BAD" indication is shown, it will be necessary to remove the flyback loads, one at a time, to determine which circuit is causing the problem. Repeat the Ringing Test each time.

If a "GOOD" indication does appear, the last circuit disconnected was responsible for loading the coil being tested. If the horizontal output transformer itself is at fault, it will show up as a "BAD" indication with the transformer completely disconnected. This final check should be made on all suspected defective flybacks before a replacement is ordered. If all loads are disconnected, the work of replacing the transformer is half finished.

NOTE: See Service Tip 2 for information on removal of the High Voltage rectifier tube.

See Service Tips 8, 12, and 15 for details on causes of "BAD" tests.

COMPLETE FLYBACK CHECK

The FLYBACK QUICK CHECK just described will locate most flyback defects with a single test. The test will locate any opens in the high voltage winding of the transformer, and will also show if any of the windings in the entire transformer has a shorted turn (since this shorted condition will reflect through to the other windings in the transformer.)

In a few rare cases, however, one of the other windings in the transformer may develop an open. If this condition is indicated by the operations of the set, each coil may be rung individually for a full flyback test. To perform this test, proceed as follows:

1. Determine the number of coils in the transformer from servicing literature written for the transformer, or TV set.

2. Connect the test leads of the Ringer across one of the coils other than the high voltage coil already tested.

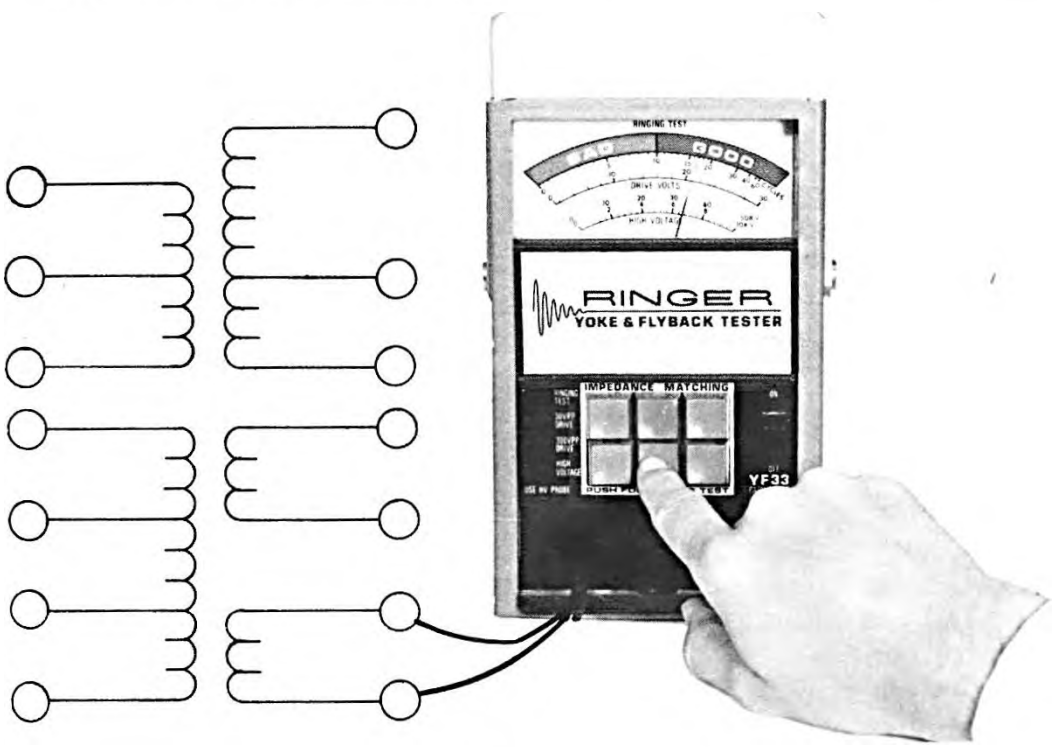
NOTE: Coils with several center-taps may be tested with a single test IF the coil is rung from end to end. All series-connected sections of the coil will be rung, and an open in any section will produce a "BAD" test.

3. Depress each of the IMPEDANCE MATCHING pushbuttons in turn. If one or more of the buttons produces a GOOD test, the coil being tested is good.

4. If the first coil section tests "GOOD", move the Ringer Test leads to the next coil.

5. Repeat steps 3 and 4 across the remaining coils.

6. If all coils produce a "GOOD" test, the flyback is not the cause of the television malfunction.



Out of Circuit Flyback Check

It is possible to encounter a winding in a flyback that consists of only a few turns. These windings, when rung separately, may not give a "GOOD" indication, even though they are good, because of the low "Q" value for these coils. To determine whether a low turn coil is good or bad the following procedure can be used.

If the winding is shorted, the other windings of the flyback will read "BAD".

To be certain the winding is not open, apply a short across the winding under question while ringing any one of the other windings. If the winding is open, there will be no change in the Ringing Test. If the winding is not open, the number of rings will decrease, producing a bad test.

NOTE: See Service Tip 13 for additional information on testing series coils.

See Service Tip 15 for information on testing a flyback out of the TV receiver.

USE OF SENSITIVITY CONTROL

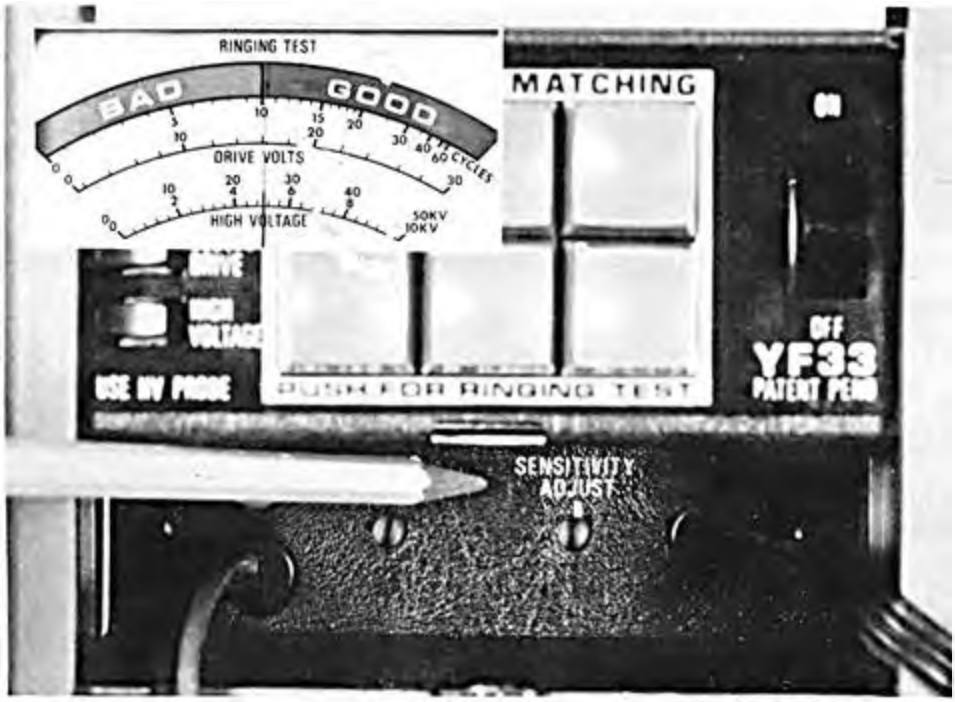
Because of the wide range of yoke and horizontal output transformer types in use, a few coils of good quality may read slightly in the "BAD" area of the Ringing Test. Likewise, some coils may read slightly in the "GOOD" area, even with a defect. These types are extremely rare at present.

Experience may show that these marginal indications are more common to a particular TV brand, or a particular chassis model. The YF33 SENSITIVITY ADJUST control (located in the Lead Storage Compartment) can be adjusted to provide a more definite indication with these coils. If you encounter a brand, or chassis type that varies from the standard 10 cycle ringing test, simply follow these steps:

1. Connect the YF33 to a known good coil, using the instructions for the type of coil being tested.

2. Hold down the IMPEDANCE MATCHING button giving the highest Ringing Test count. Adjust the SENSITIVITY ADJUST to obtain 11 rings as indicated on the meter.

3. This test can then be repeated on coils having suspected problems, and the results compared to the good coil tested.



Setting Sensitivity Adjust

MEASURING PEAK-TO-PEAK DRIVE VOLTAGES

Since the operation of the horizontal output circuit and the boost and High Voltage circuits are all directly related, the Ringer is equipped for checking all sections of the horizontal output stage. Two scales are included for checking the Drive Signal going to the horizontal output stage, and another section is included for checking boost, focus, regulator, and high voltages.

The following instructions explain the uses of these various test sections:

CAUTION: Make connections to the receiver only with the set power off. Turn the power on only to make the test, and turn it off before removing the test leads.

1. With set power off, connect the YF33 black lead to chassis or ground. Connect the red lead to the Horizontal Output tube grid, or the Horizontal Output transistor base.

2. Depress the 300V P—P DRIVE FUNCTION button. Turn the set power on and read the DRIVE VOLTS meter scale. (Multiply reading by ten for peak-to-peak Drive Signal voltage).

3. If the voltage reads below 30V P—P, depress the 30V P—P DRIVE button and read the Drive Signal directly on the DRIVE VOLTS meter scale.

4. Refer to the receiver schematic for proper drive voltage. A chart of "Typical Drive Signals" is on the back of the YF33, listing average drive values used in horizontal drive sections of most TV sets. The values listed are average conditions, and may vary somewhat from one chassis to another. Tubes are listed by type number without the filament voltages. Thus, a 5GY5 and a 50GY5 are both listed as --GY5.

5. Turn off set power before disconnecting the leads.

NOTE: If the RINGING TEST button is accidentally depressed, no damage to the YF33 will result.

MEASURING HIGH VOLTAGE

Optional FP201, 10KV Probe

CAUTION: Make connections to the receiver only with the set power off. Turn the power on only to make the test, and turn it off before removing the test leads.

CAUTION: To insure complete protection to the operator during high voltage tests, do not defeat the grounding plug on the Ringer.

1. For measuring focus or regulator voltage:

   a. Insert the banana plug on the FP201 Focus Voltage Probe into the HIGH VOLTAGE jack in the Lead Storage Compartment.

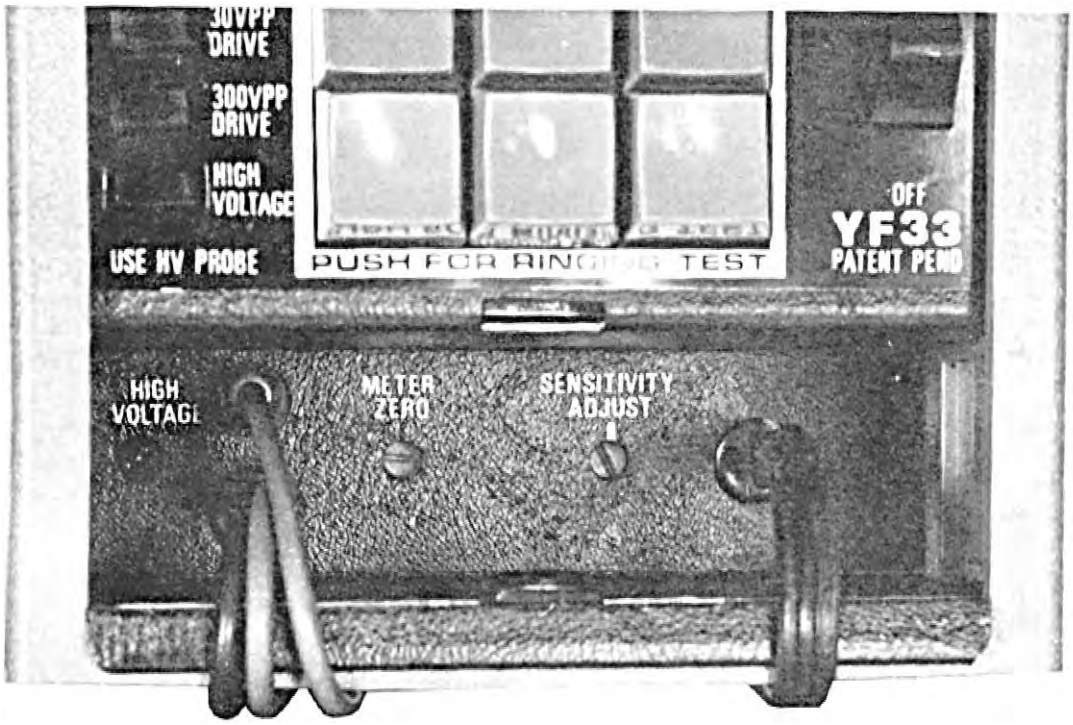
   b. Depress the HIGH VOLTAGE Function button.

   c. Attach the black YF33 lead securely to the TV chassis or ground so that it cannot be disconnected during measurement.

   d. Connect the FP201 Focus Voltage Probe to the test point and apply power to the set.

   e. Read the voltage on the 10Kv scale of the YF33 meter. Compare with the schematic value for recommended voltage.

f. Turn off the set power and remove the probe from the test point.



Connecting High Voltage Probe

2. For measuring Second Anode High Voltage

   a. Insert the banana plug of the FP201 Focus Voltage Probe into the HIGH VOLTAGE jack in the Lead Storage Compartment.

   b. Slip on the 39G89 50Kv High Voltage adaptor over the FP201 Focus Voltage Probe.

Adding 39G89, 50KV Probe, to FP201

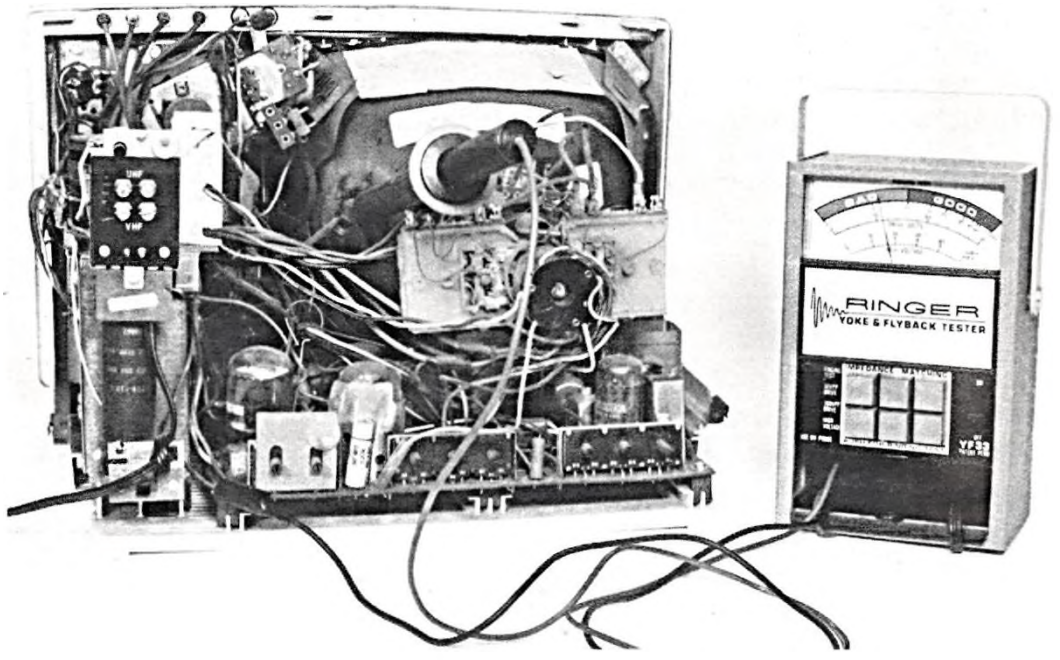
c. Depress the HIGH VOLTAGE Function button.

d. Attach the black YF33 lead securely to the TV chassis or ground so that it cannot be disconnected during measurement.

e. Connect the High Voltage Probe to the CRT Second anode button and apply power to the set.

f. Read the voltage on the 50Kv scale of the YF33 meter. Compare with the schematic value for recommended voltage.

g. Turn off the set power and remove the probe from the connection.



High Voltage Test

CAUTION: If the ground lead should become detached, during a measurement, immediately turn off set power. Then reconnect the ground lead. DO NOT TOUCH THE GROUND LEAD OR RINGER WITH THE GROUND LEAD DISCONNECTED AND TV POWER APPLIED!

NOTE: See Service Tip 14 for information about servicing the High Voltage section.

UPDATING FOR FUTURE COILS

The design of the YF33 has taken into account all known values of yoke and flyback coils available. It is unlikely that the impedance of solid-state yokes will drop much lower than those in use at present. If these values should be changed, however, the YF33 can easily test these new yokes with a simple modification of the Ringing Test. The use of this modification renders the Ringer virtually obsolete proof.

Procedure for testing very low impedance yokes:

1. Connect the test leads of the Ringer to a known good coil to be tested.

2. Connect a .15uF capacitor in parallel with the yoke.

3. Perform Ringing Test.

4. If test on known good coil shows "BAD", increase value of external capacitor in steps of .1uF until "GOOD" test is obtained.

5. When coil tests "GOOD", repeat test using same capacitor on suspected bad coil.

6. Read quality of coil on meter as done in regular Ringing Test.

7. After testing special yoke, remove external capacitor before testing standard coils.

CIRCUIT DESCRIPTION

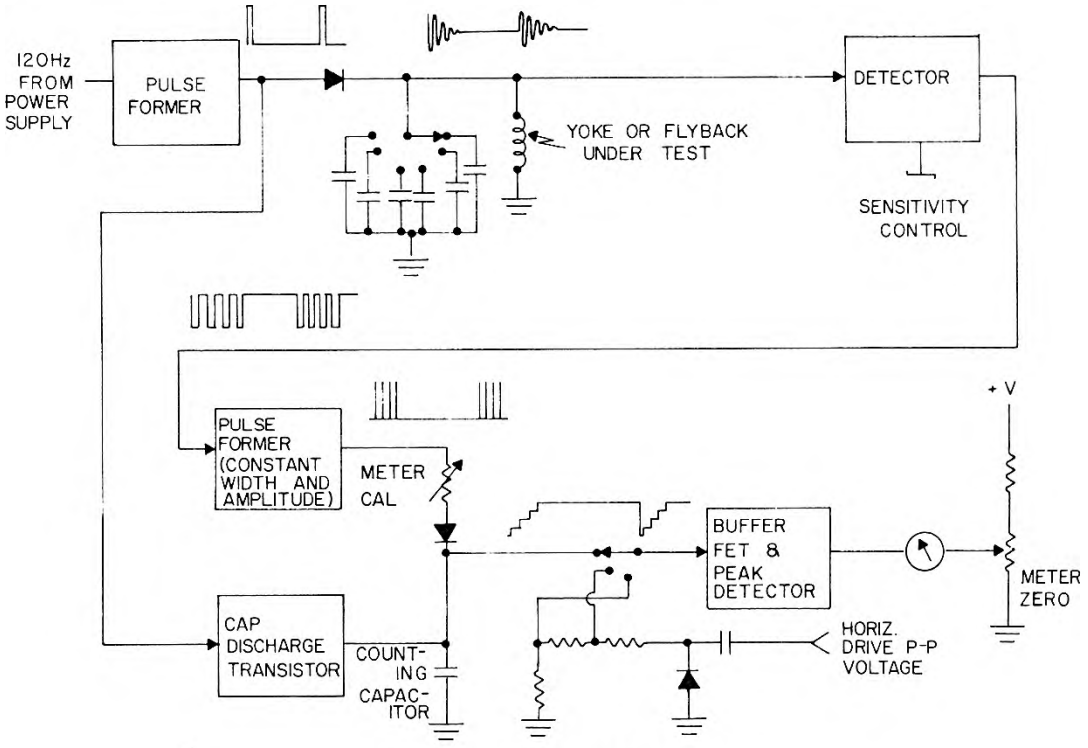
THEORY OF OPERATION

If a coil and capacitor are connected to form a parallel resonant circuit, and a single pulse is applied to that circuit, the circuit will be shocked into ringing. This ringing produces a damped sine wave signal. The number of times the circuit rings depends on the speed the signal is damped which in turn depends on the Quality Factor or "Q" of the circuit.

The circuit's "Q" is determined by the values of both the coil and capacitor, but primarily by the coil.

The Ringer takes advantage of this fact to determine the "Q" of a given coil. A pulse is applied once every few milliseconds, and the number of ringing cycles the circuit produces before being damped to a particular value are counted and displayed on a meter.

Six different values of capacitance are provided to allow the Ringer to be matched to any TV yoke or flyback coil to test for this ringing, no matter what circuit value the coil under test has.



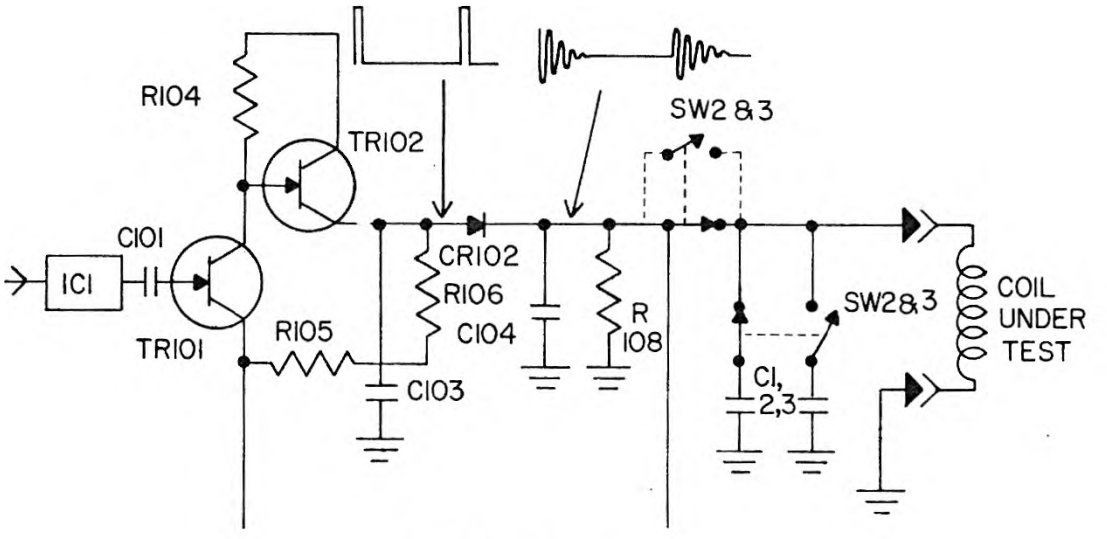
Ringer Block Diagram

POWER SUPPLY

The YF33 power supply consists of a full wave bridge rectifier supplied by a 44VAC center tapped transformer secondary. The rectifier bridge consists of CR105, 106, 107 and 108. CR109 zener diode regulates the —15VDC supply and CR110 zener diode regulates the +15VDC supply. R117 and R118 are current limiting resistors in series with zener regulators. C107 and C108 are filter capacitors. IC1 requires +15VDC while pulse amplifier and detector circuits require both positive and negative 15VDC for operation. The meter bridge FET, TR106, requires —15VDC and approximately +23VDC taken directly from the rectifier bridge before the zener diode. This voltage is filtered by R119 and C109.

PULSE FORMER

The pulse generator consists of IC1C, IC1D and associated components. Pulse width is determined by the time constant of R101, R102 and C102. The repetition rate is synced to a frequency twice the line frequency by a signal coupled from the full wave power supply bridge rectifiers through C106 to the inputs of IC1D.



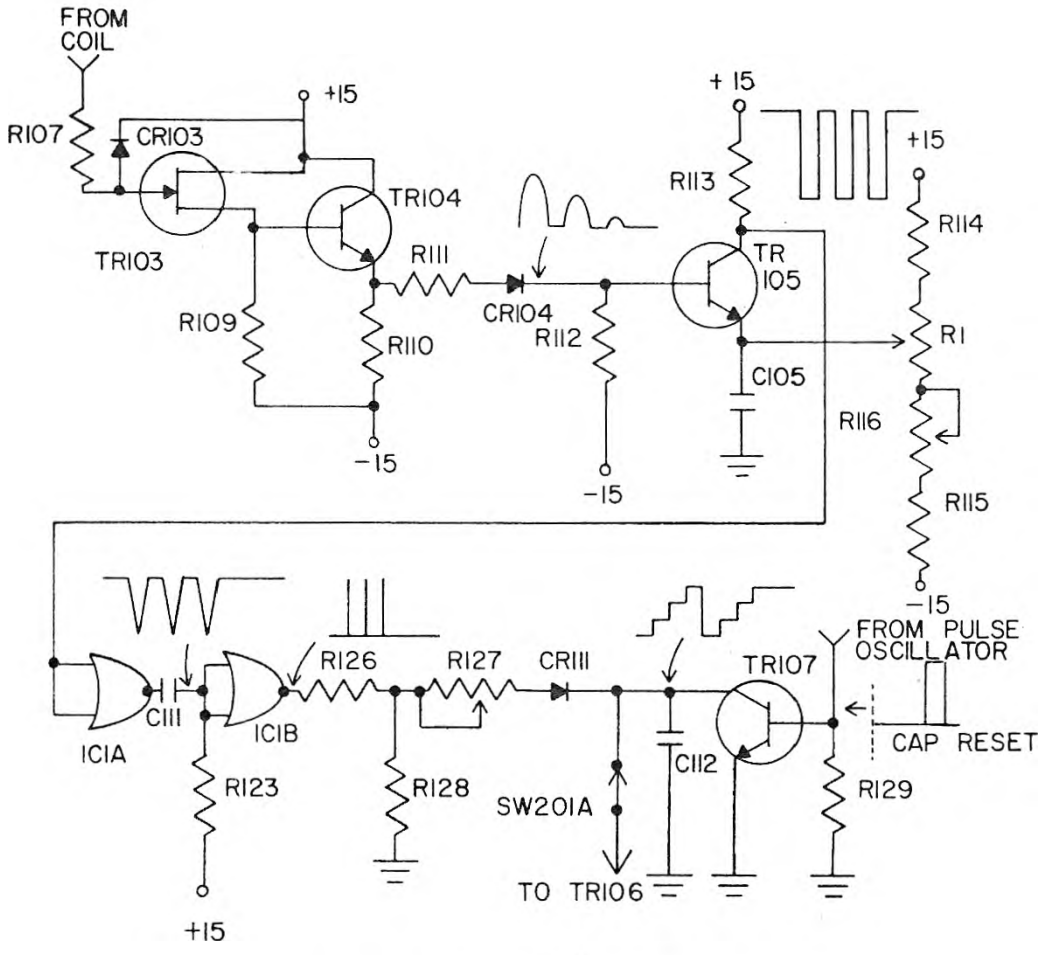
Pulse Former

The output of IC1C is a negative 15 volt pulse fed through C101 to the pulse amplifier, TR101, which inverts the signal and applies it to the base of emitter follower, TR102. TR102 emitter supplies a positive pulse from a low impedance source through CR102. From this point it is fed to the Ringer red test lead through any of the six impedance matching switches. This current pulse is used to start the ringing in the coil being tested. The proper impedance matching capacitor is selected through one of the six pushbuttons. These capacitors are C1A and B, C2A and B and C3A and B.

RING BUFFER AND DETECTOR

After the ring starting pulse has energized the coil under test, the coil produces a ring (decaying oscillation), which is fed back to the gate of TR103 through R107. The input buffer FET, TR103, couples the ring signal to the emitter follower, TR104. From the emitter of TR104 the signal is transferred through R111 and CR104 to the base of the level detector transistor, TR105.

The base and emitter of TR105 are biased by the Sensitivity Adjust Control to a positive potential. Positive ring pulses, fed through CR104, will only pass through this diode while their amplitude exceeds the positive bias level on the cathode of CR104. Therefore, TR105 will only conduct on pulse amplitudes above the sensitivity bias voltage. The Sensitivity bias is adjusted to a level that will allow passage of pulses above 25% of the ring starting pulse amplitude or approximately 3.75 volts. Sensitivity calibration is adjusted by R116, with R1 at mid-range.



Ring Buffer, Pulse Detector and Counter

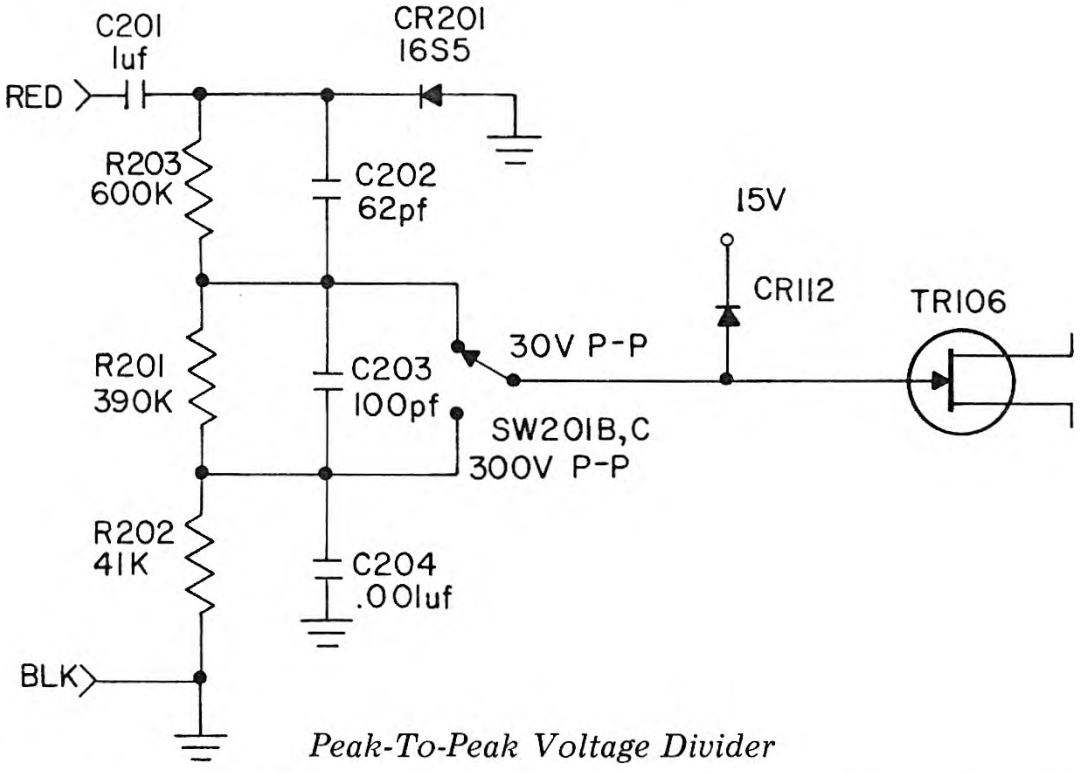
CR103 on the gate of TR103 is a protection device to limit input voltage on the gate of TR103 to a maximum of 15 volts positive. C105 is an emitter decoupling capacitor.

PULSE COUNTER

The negative pulses out of the level detector, TR105, are fed to the meter circuit, consisting of IC1A, IC1B, TR107 and associated components. These pulses are of unequal widths and must be formed into positive pulses of equal width and amplitude. The train of negative pulses fed to IC1A inputs 1 and 2 produce an output of positive pulses which are integrated by C111 and R123. The inputs 5 and 6 of IC1B are biased positive holding the output pin 4 at zero. The negative portion of the integrated output of IC1A will then produce a positive pulse at IC1B pin 4 output. This positive train of pulses is fed through R127, meter cal pot, and CR111 to C112. C112 will be step charged by each succeeding pulse to a level determined by the number of pulses in the train. This charge level potential is felt on the gate of TR106, meter bridge FET, where it is converted, by the peak

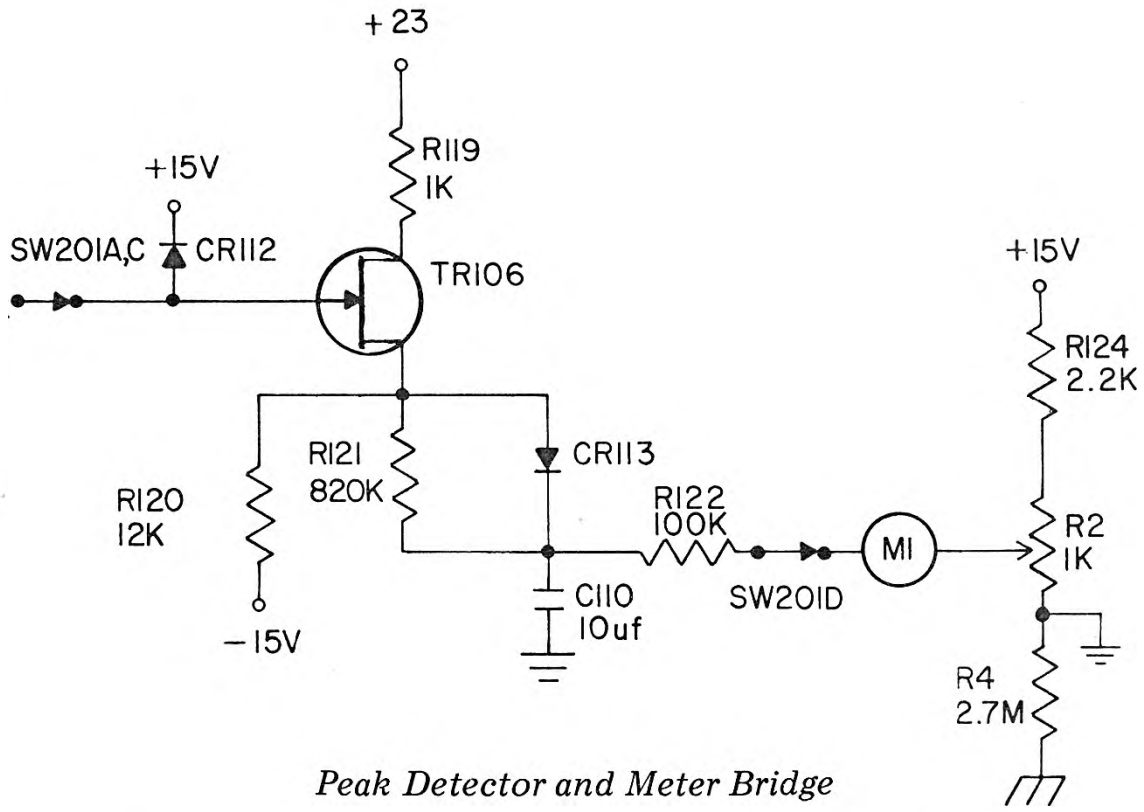
detecting circuit, C110, CR113 and R121, to a meter indication by meter, M1. When the next ring starting pulse appears, a portion of that pulse is fed through C103 to the base of TR107 which discharges C112, preparing this capacitor for the next pulse counting cycle.

PEAK DETECTOR AND METER BRIDGE



Peak-To-Peak Voltage Divider

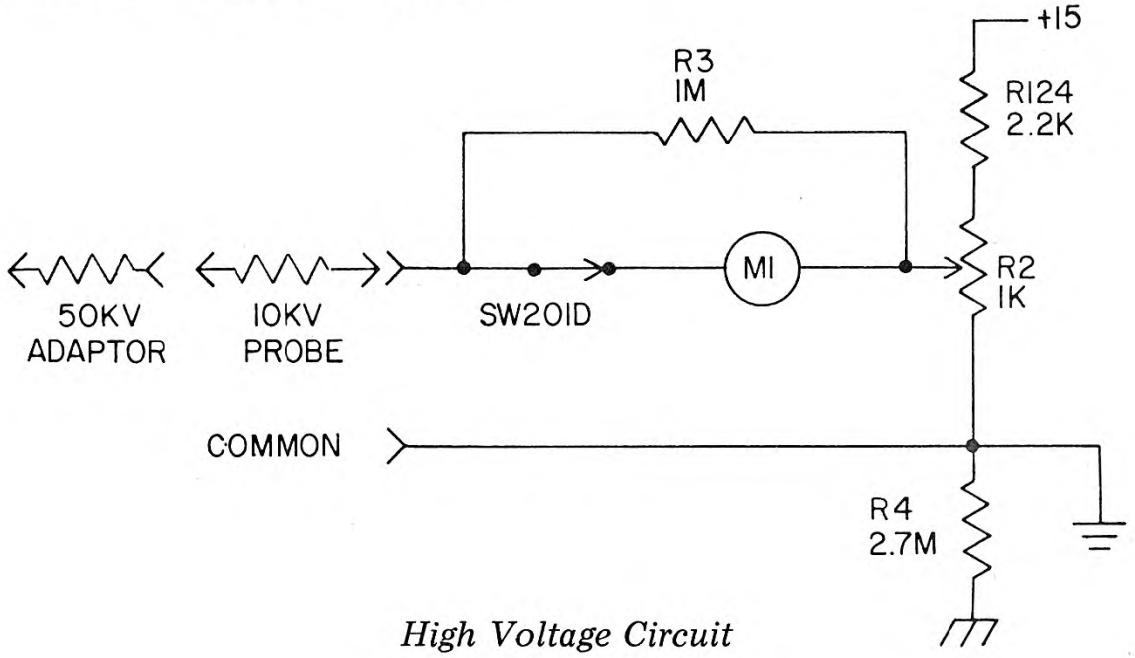
When measuring drive voltages, it is necessary to measure the peak voltage of the signal. The AC signal is fed in on the test leads through switch SW2B or C and C201 to an AC clamp and divider network comprised of CR201, R201, R202 and R203. The positive portion of the AC signal is clamped to ground reference by CR201 and divided by SW2B or C and a portion of the AC signal is fed to the gate of TR106. The source of TR106 has a positive potential determined by the Idss of this FET. This potential is felt on the positive meter terminal. An equal positive voltage is applied to the negative meter terminal by METER ZERO control, R2 to maintain electrical zero of the meter. When a positive AC signal peak is felt on TR106 gate this same peak voltage is transferred to the source where it charges C110 to peak value through CR113. This potential unbalances meter M1, causing it to read upscale. The meter will read the true P—P value of the applied signal.



Peak Detector and Meter Bridge

Diode CR112 is used as a protection device for TR106. The gate voltage will be limited to a maximum of +15 volts to protect the FET should an incorrect range be used for measuring horizontal drive signals.

HIGH VOLTAGE CIRCUIT



High Voltage Circuit

With the HIGH VOLTAGE selector button depressed the meter, M1, is connected between the zero control and the High Voltage input jack. The ratio of probe resistance to meter resistance is such that with full rated voltage (10Kv or 50Kv) applied to the proper probe, the meter will read full scale. A fixed 1 Meg resistor R3 is tied between the High Voltage input jack and ground to limit the voltage inside the instrument should the high voltage measurement be attempted with a test function button (other than the HIGH VOLTAGE button) depressed. A 2.7 Meg resistor is connected from circuit ground to the chassis to prevent internal arcing if the ground lead becomes disconnected during a high voltage measurement. The return is made through the 3rd wire ground in the AC line cord.

CALIBRATION

SENSITIVITY

1. Adjust the SENSITIVITY ADJUST to the center rotation position.

2. Connect the test leads to a known good yoke coil and depress the RINGING TEST Selector button.

3. Connect a scope using a Lo-Cap Probe to the emitter of TR104 junction of R110, (8.2K) and R111 (12K) resistors. Connect the scope common to the YF33 black test lead.

4. Push one of the test buttons and adjust the scope for 4 divisions of deflection above zero reference for the first Exciting Pulse.

5. Count the number of RING PULSES from the initial ring up to and including the cycle at 1 division amplitude on the scope.

6. Connect the scope probe to pin 5 of IC1. Adjust the SENSITIVITY CAL control (R116) for the same number of pulses as counted in step number 5, with the same button pressed.

METER

1. Using the set-up described in steps 1 and 2 above, connect the scope probe to pin 4 of IC1.

2. Perform the Ring Test. Connect a 10 Meg rheostat across the coil. While holding the button that gave the highest reading, adjust the rheostat until 10 full pulses are shown on the scope.

3. With the same button still depressed, adjust the METER CAL Control (R127) until the meter reads mid-scale (line between "GOOD" and "BAD".)

SERVICE TIPS

1. FAMILIARIZATION

To familiarize yourself as to the type of test the Ringer provides, you may wish to connect an oscilloscope across the coil you are testing while holding the proper IMPEDANCE MATCHING pushbutton and noting the damped sine wave the coil produces. This procedure is not recommended during actual testing, however, since the scope (even with a Lo-Cap Probe) may affect the high sensitivity of the Ringer to such a degree as to provide an incorrect reading.

2. HV RECTIFIER TUBE

If, while doing an in-circuit Ringing Test, you obtain a "BAD" reading, the filament of the High Voltage rectifier may be loading the flyback transformer. Remove the rectifier and repeat the Ringing Test. If the circuit now tests "GOOD", the yoke and flyback are not the problem with the output stages.

3. DIFFERENCES BETWEEN IN AND OUT OF CIRCUIT TEST

Some circuits may show "BAD" when the yoke and flyback are connected, but each will check "GOOD". This is because the time-constants for each coil may "fight" each other resulting in a "BAD" test. Whenever you get a "BAD" test in circuit, the individual components should be tested to determine the true cause of the "BAD" reading.

4. YOKE READING GOOD AFTER BEING REMOVED FROM CRT NECK

On some yokes, a "BAD" condition may apparently correct itself when the yoke is pulled off the tube. This is caused by some of the yoke wires being shorted by the pressure of the yoke mounting assembly. Any yoke that reads "BAD" on the CRT and "GOOD" out of circuit is considered bad since it will not work when mounted. **This is why the yoke should always be tested before it is removed.**

5. LOCATING HORIZONTAL YOKE WINDINGS

To trace the wiring coming from the yoke, keep in mind that the horizontal yoke windings are located at the top and bottom of the yoke as installed on the CRT neck. These are windings closest to the CRT.

6. TESTING TUBE - TYPE HORIZONTAL YOKES

Most tube-type sets have the horizontal windings connected in series. Three leads are attached, two outer connections and a center-tap. Connecting the YF33 to the outer leads will check both windings. Connecting the YF33 to the center tap will check only one of the windings. When using the center tap the Ring Test will need to be repeated for both coils. If tested separately, both coils should ring the same number of times (See tip 9 for more details).

7. TESTING SOLID STATE HORIZONTAL YOKES

Most solid state sets have the horizontal windings connected in parallel because of the lower circuit impedances used. Only two wires are attached across these windings. Connect the YF33 across the two horizontal leads at the yoke or plug connector. The Ringer will test both coils at the same time.

8. HORIZONTAL DAMPING RESISTORS

If a "BAD" yoke test is obtained, the cause may be damping resistors connected in parallel with the yoke windings causing the Ring Test to dampen too quickly. In many yokes, these resistors are in the chassis rather than the coil housing, and are disconnected when the yoke is disconnected from the chassis. In others, the resistors are located in the yoke housing. If so, they should be removed from circuit by disconnecting one end of the resistor. The Ring Test should then be repeated.

9. TESTING VERTICAL YOKE COILS

Since the vertical yoke coils are usually separate coils, they should be tested separately. When making a test on this pair of coils, the technician should note both the button that gave the highest reading, and the number of ringing cycles shown on the meter. Both coils should give the same number of rings on the same button. If not, the yoke is beginning to go bad and should be replaced. This type of yoke failure shows up on the TV as the appearance of retrace lines on the TV picture.

10. VERTICAL DAMPING RESISTORS

As with the test of the horizontal section of a yoke, any damping resistors should be disconnected before the yoke can be tested with the Ringing Test. In many yokes, these resistors are in the chassis rather than the coil housing, and are disconnected when the yoke is disconnected from the chassis. In others, the resistors are located in the yoke housing. If so, they should be removed from circuit by disconnecting one end of the resistor. The Ring Test should then be repeated.

11. CONVERGENCE COILS

Some color yoke assemblies contain convergence circuitry within the housing. These convergence coils should be disconnected and the Ringing Test made as a final check before replacing a suspected defective yoke.

12. WHEN TO TEST IN CIRCUIT

The procedure suggested for testing any coil is to first test the coil in circuit. If the test produces a "BAD" test, the external circuits are then disconnected one at a time until either a "GOOD" test is obtained or all circuits have been disconnected and the coil tested by itself.

If disconnecting one of the external circuits produces a "GOOD" Test, the technician immediately knows the coil is good, and that the external circuit is loading the test. If the last circuit disconnected was a damping resistor or diode, these results are to be expected. If, however, the circuit has some other function, such as an output amplifier, the test indicates a defect in that circuit.

If the technician finds that the coil tests "BAD" with all external circuits disconnected, he knows the coil itself is the cause of the improper circuit operation. Since all external circuits would have to be disconnected to replace the coil, the job of replacing the defective coil is more than half done.

13. LOOKING FOR OPEN COILS IN FLYBACK TRANSFORMERS

If there are any capacitors connected in parallel with one of the coil sections in a multi-tapped coil, one end of the capacitor should be removed from the circuit if a complete test of the coil is to be made. The reason being, it is possible for a capacitor to bridge across an open coil and bypass the open condition. If the coil has only one section (or a capacitor connected across the entire coil) this capacitor should not affect the performance of the Ringing Test in looking for open coils.

14. PREVENTING REPEATED COIL FAILURES

The flyback transformer is the second most costly single component to be replaced in a TV chassis (second only to the CRT). To insure a satisfied customer, several checks should be made after a new transformer is installed. These checks may also prevent the need to replace the transformer a second time within a short period of time.

Using the YF33 Ringer and a versatile meter such as the FE27 Big Henry or DVM32 Digital Volt Meter, all signals related to the operation of the flyback transformer can be checked. These include B+, Horizontal drive signals, output tube or transistor bias, cathode (or collector) current, and screen and suppressor grid voltages. If any of these values are not as specified by the set manufacturer, the cause of the defect should be determined. The use of the YF33's drive voltage check and high voltage checks eliminate the need for an oscilloscope or high-voltage meter for these tests.

The high voltage section of the wiring should be inspected for proper lead dress,

good solder connections, and removal of foreign material such as solder rosin or dust that may cause high voltage leakage paths. The areas around the high voltage sections should be inspected for signs of arcing with the set operating. If any signs of arcing are present, they should be corrected.

One last check to be made is a test of the second anode voltage. An improper value of high voltage may indicate a defect in the regulator circuit, or an improper adjustment of the high voltage section. If this voltage is not checked, the new flyback transformer or some other component in the high voltage section may be damaged, or the set may produce an increased amount of X - radiation. This final test is best performed in the home to insure proper operations of the set in its final location.

15. EFFECTS OF METAL ON COIL UNDER TEST

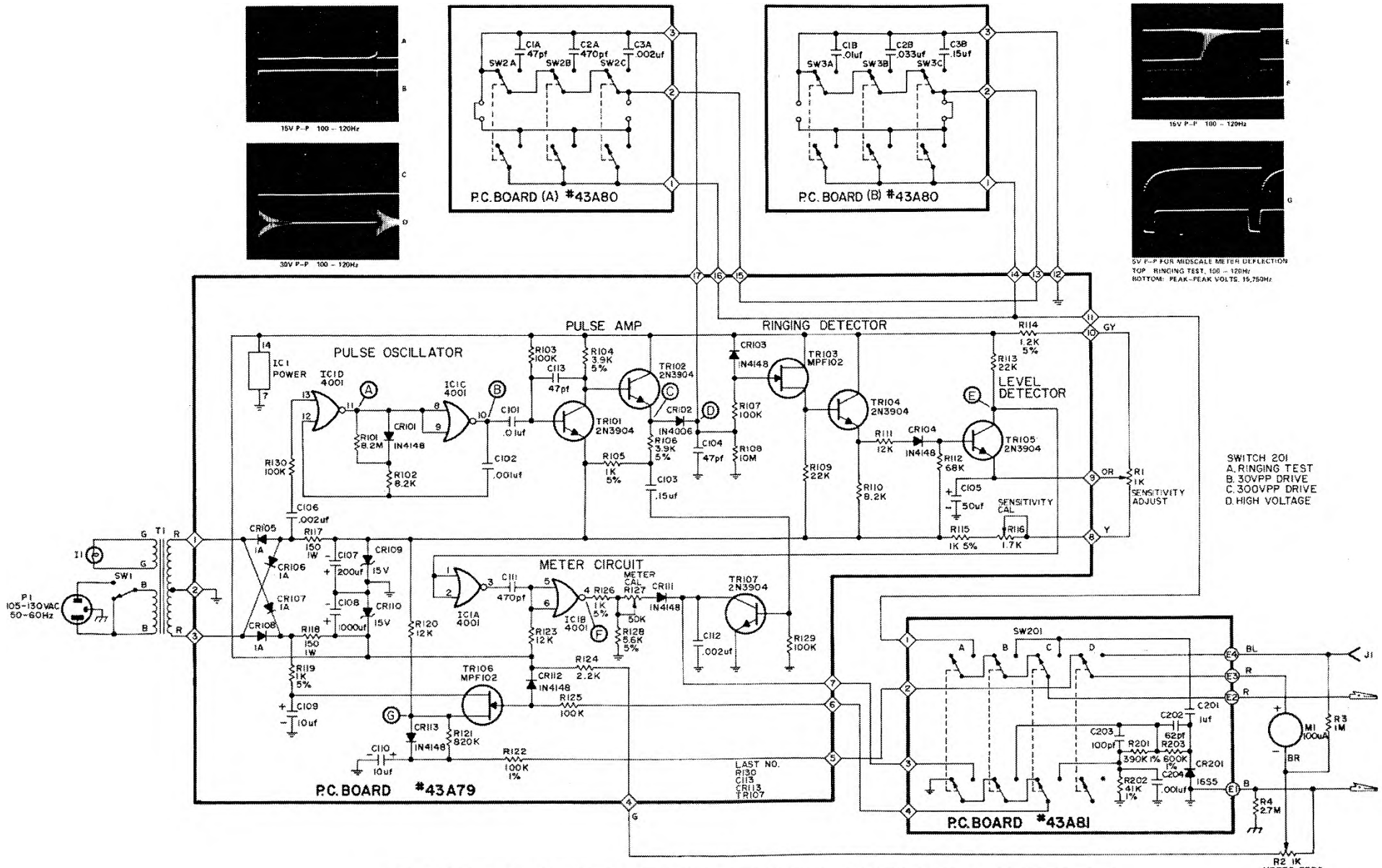
If a coil is tested outside a TV set, large metal surfaces, such as a metal table top, can act the same as a shorted turn. Because of this, out of circuit testing should be made with the coil at least three inches from any large metal mass.

YF33 PARTS LIST

SCHEMATIC REFERENCE	PART NO.	DESCRIPTION	PRICE
CR101, 103, 104, 111, 112, 113	50C5-2	Diode, 1N4148	.25
CR105, 106, 107, 108	16S10	Rectifier, 1A, 400PIV	.50
CR201	16S5	Rectifier, 1A, 800PIV	.50
IC1	69G7	IC, 4001	2.00
M1	23C56	Meter, 100uA	20.00
R1, 2	15C3-28	Control, 1K	.75
SW1	25A155	Switch, Slide SPDT	.50
SW2, 3	25A221	Switch, 3 pushbutton 2 - pole	3.25
SW201	25A222	Switch, 4 pushbutton 2 - pole	4.00
T1	128B65	Transformer Assy.	8.25
TR101, 102, 104, 105, 107	19A33	Transistor, 2N3904	.50
TR103, 106	19A19	Transistor, MPF102	.75
	110C293	Case Wrap riveted Assy.	6.75
	110C294	Meter Door Riveted Assy.	1.75
	108K134	Front Panel Riveted Assy.	3.00
	110A295	Lead Storage Door Riveted Assy.	1.75
	107K211	Pot mtg. Bracket Riveted Assy.	1.75
	143A79	Main P.C. board Assy.	31.25
	143A81	Function Switch P.C. Board Assy.	10.25
	143A80A	Impedance switch P.C. Board Assy. (top)	13.25
	143A80B	Impedance switch P.C. Board Assy. (bottom)	14.25
	21A44-B	Glamor Cap, slide switch	.25
	21G45-B	Pushbutton, Black	.25
	21A58	Pushbutton, grey	.25
	8A99-3	Escutcheon, case wrap	1.00
	8A87	Escutcheon, meter door	.75

Prices in effect at date of printing and are subject to change without notice.

When ordering parts, please specify model number, part number and description. Service and parts invoices are C.O.D. Please include remittance (check or money order) with your order to save C.O.D. charges. Minimum billing $3.00.



SCHEMATIC DIAGRAM YF33 RINGER

ISSUE DATE: 8-21-75

SERVICE AND WARRANTY

You have just purchased the finest Yoke and Flyback Tester on the market today. The Sencore YF33 has been inspected and tested twice at the factory and has passed a rugged use test by our Quality Assurance Department to insure the best quality instrument to you. If something should happen, the YF33 is covered by the Sencore Made Right guarantee as explained in the warranty policy enclosed with your instrument.

Sencore has six Regional Offices to serve you. Instruments to be serviced should be returned to the nearest Regional Office by UPS if possible. Parcel Post should only be used as a last resort. Instruments should be packed with the original packing materials or equivalent, and double boxed to insure safe arrival at the Regional Office. The display carton IS NOT an acceptable shipping container. When returning an instrument for service, be sure to state the nature of the problem to insure faster service.

If you wish to repair your own YF33 Yoke and Flyback Tester, we have included a schematic and parts list. Any of these parts may be ordered directly from the Regional Office nearest you.

We reserve the right to examine defective components before an in warranty replacement is issued.

SENCORE REGIONAL OFFICES:

Sencore East Central
4105 Duke Street
Alexandria, VA 22304
703 751-3556

Sencore Central
2711 B Curtiss Street
Downers Grove, IL 60515
312 852-6800

Sencore Western Coast
833 Mahler Road
Burlingame, CA 94010
415 697-5854

Sencore West
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Sioux Falls, SD 57107
605 339-0100

Sencore Southeastern
2459 Roosevelt Hwy
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College Park, GA 30337
404 768-0606

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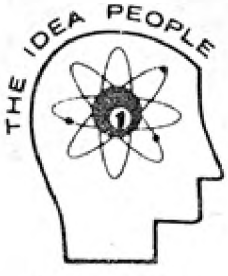

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